We Claim:

1. In a graphics pipeline, a hardware shader that blends selected inputs to provide a calculated color or opacity output that is fed back for use as an input to the hardware shader for a subsequent blending operation.

2. The pipeline of claim 1 wherein an output of the shader can be recirculated to provide n blending stages.

3. The pipeline of claim 1 wherein recirculation of said shader output allows shade tree type combining operations.

4. The pipeline of claim 1 wherein said shader provides both color blend and alpha blend operations in a same blending operation stage.

5. The pipeline of claim 1 wherein the pipeline includes a recirculating texture unit coupled to the shader, and wherein said shader blends a texture output previously provided by the recirculating texture unit while the recirculating texture unit performs a further texture mapping operation to provide a further texture output for blending by the shader.

6. The pipeline of claim 1 wherein the shader includes a programmable clamper.

7. The pipeline of claim 1 wherein the shader includes a programmable scaler.

8. The pipeline of claim 1 wherein the shader includes a comparator.

9. The pipeline of claim 1 wherein the shader includes a programmable color swap.

10. The pipeline of claim 1 wherein an output of the shader is made available as an input for a plurality of subsequent blending operations.

11. The pipeline of claim 1 wherein the shader includes separate blending circuits for performing both color blend and alpha blend operations during a same blending operation stage.

12. The pipeline of claim 1 wherein the shader includes a feedback mechanism for providing an output to an input of said shader.

13. The pipeline of claim 12 wherein said feedback mechanism includes one or more storage buffers for retaining an output from a blending operation and at least one of said buffers has an output connected to an input of said shader.

14. In a graphics system, a multi-texturing method comprising:

(a) passing texture mapping data through a component combining arrangement to provide combined textured component outputs;

(b) reconfiguring the component combining arrangement; and

(c) passing said combined textured component outputs through the reconfigured but same component combining arrangement to provide combined multi-textured component outputs.

15. The method of claim 10 wherein said steps (b) and (c) are repeated plural times.

16. The method of claim 10 wherein the component combining arrangement includes a texture color combiner.

17. The method of claim 10 wherein the component combining arrangement includes an alpha combiner.

18. A method for providing multi-textured polygons comprising:

(a) generating first texture mapping data;

(b) passing the first texture mapping data through combiner hardware to provide a first output corresponding to the first texture mapping data;

(c) generating second texture mapping data; and

(d) passing the second texture mapping data and the first output through the combiner hardware to provide a second output corresponding to the first and second texture mapping data.

19. The method of claim 14 wherein step (b) is performed during a blending stage, and step (d) is performed during a further blending stage that is later than the first-mentioned blending stage.

20. The method of claim 18 wherein the combiner hardware provides more than ten successive stages of texture mapping data blending.

21. In a graphics rendering pipeline including at least one texture mapping unit and a texture environment unit including combiner circuits, an improvement comprising iteratively reusing the combiner circuits to provide multiple stages that apply multiple textures to a surface displayed within an image.

22. The method of claim 21 wherein the iteratively reusing step includes using the combiner circuits to combine first texel colors during a first blending cycle/stage, and using the same combiner circuits to combine second texel colors using a second blending cycle/stage different from the first cycle/stage, the first and second cycles/stages both falling within a period for generating a single image frame.

23. The method of claim 21 where the first and second cycles/stages are consecutive.

24. The method of claim 21 wherein the combiner circuits comprise independent color combiner circuits and alpha combiner circuits.

25. The method of claim 21 wherein the combiner circuits compute

$(D + (-1)^{sub} * ((1-c) * A + C * B) + bias) << shift$

where A, B, C and D are selected from four current-color registers, rasterized color, texture, alpha components, 0 and 1.

26. In a graphics system including a processing pipeline that renders and displays images at least in part in response to polygon vertex data and texture data stored in an associated memory, a multitexture processing subsystem for selectively mapping texture data corresponding to one or more different textures and/or texture characteristics to surfaces of said rendered and displayed images, said multitexture processing subsystem comprising:

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a color/alpha-component blending unit configured within the pipeline to combine texture, rasterized color and/or alpha component data to produce a computed color and having a feedback mechanism that enables reintroduction of the computed color into the pipeline, wherein a processing of multiple textures is achieved by an iterative use/reuse of the blending unit.

27. A multitexture processing subsystem as in claim 26 wherein the blending unit comprises at least one multiplier and one adder and is configured to accept up to four input arguments for performing blending operations.

28. In a graphics system including a processing pipeline that renders and displays images at least in part in response to polygon vertex data and texture data stored in an associated memory, a multitexture processing subsystem for selectively mapping texture data corresponding to one or more different textures and/or texture characteristics to surfaces of said rendered and displayed images, said multitexture processing subsystem comprising:

a texture environment unit configured within the pipeline to process input texture, color and/or alpha data during a predetermined processing stage to accomplish a blending and/or mixing of textures and/or colors or alpha data, said texture environment unit including a color/alpha data blending unit having a feedback mechanism operable during selected temporal processing stages wherein an output of a current processing stage is made available as an input to a subsequent processing stage.

29. A multitexture processing subsystem as in claim 28 wherein the blending unit is connected to at least one storage register for making an output of a current processing stage available as an input to a subsequent temporal processing stage.

30. A multitexture processing subsystem as in claim 28 wherein the texture environment unit may accommodate up to sixteen successive temporal processing stages.

31. A multitexture processing subsystem as in claim 28 wherein the feedback mechanism comprises a plurality of storage registers.

32. A multitexture processing subsystem as in claim 28 wherein the blending unit comprises at least one multiplier and one adder and is configured to accept up to four input arguments for performing blending operations.

33. In a graphics system including a processing pipeline that renders and displays images at least in part in response to polygon vertex data and texture data stored in an associated memory, a multitexture processing subsystem for selectively mapping texture data corresponding to one or more different textures and/or texture characteristics to surfaces of said rendered and displayed images, said multitexture processing subsystem comprising:

a texture environment unit configured within the pipeline to process input texture and rasterized color data to provide independent mathematical blending operations on input texture and rasterized color data during a predetermined temporal processing cycle/stage, said texture environment unit including a feedback mechanism operated during selected temporal processing cycles/stages wherein an output of a current temporal processing cycle/stage is made available as an input to a subsequent temporal processing cycle/stage.

34. A multitexture processing subsystem as in claim 33 wherein the input texture and rasterized color data comprises RGB and Alpha data.

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35. A multitexture processing subsystem as in claim 33 wherein an output of a texture environment unit temporal processing cycle/stage is available as an input to a subsequent texture environment temporal processing stage.

36. A multitexture processing subsystem as in claim 33 wherein the texture environment unit may accommodate up to sixteen successive temporal processing stages.

37. A multitexture processing subsystem as in claim 33 wherein the texture environment unit further comprises a blending unit having at least one multiplier and one adder.

38. A multitexture processing subsystem as in claim 33 wherein the blending unit is configured to accept up to four input arguments for performing blending operations.

39. In a graphics system including a processing pipeline that renders and displays images at least in part in response to polygon vertex data and texture data stored in an associated memory, a texture processing subsystem for selectively mapping texture data corresponding to one or more different textures and/or

texture characteristics to surfaces of said rendered and displayed images, and a texture environment unit for processing input texture and rasterized color data to provide independent mathematical blending operations on said input texture and rasterized color data, a method for processing multiple textures comprising the steps of:

(a) performing blending operations on a first set of texture and rasterized color data during a first texture environment unit temporal processing cycle/stage; and

(b) providing an output of said first temporal processing cycle/stage as an input to a subsequent texture environment unit temporal processing cycle/stage.

40. A method for processing multiple textures as in claim 39 wherein an output from up to sixteen successive texture environment temporal processing stages may be provided as an input to a subsequent texture environment unit temporal processing cycle/stage.

41. A method for processing multiple textures as in claim 39 wherein input texture and rasterized color data comprise RGB and Alpha data.

42. A multitexture processing subsystem as in claim 28 wherein an output of a current processing stage is made available as an input to a plurality of subsequent processing stages.

43. In a graphics system including a multitexture processing subsystem for selectively sampling texture data corresponding to one or more different textures and/or texture characteristics, a hardware shader for performing shading/blending operations that receives a first texture data sample and a subsequent texture data sample from said multitexture processing subsystem and recirculates an output from a shading/blending operation performed using the first texture data sample to

an input of said shader for performing a shading/blending operation using the subsequent texture data sample and the output from the shading/blending operation performed on the first texture data sample.

44. A graphics pipeline including a multitexture processing subsystem that sequentially provides samples of multiple textures to a hardware shader that performs blending/shading operations on texture sample outputs of the multitexture processing subsystem wherein said hardware shader recirculates a resulting output of a blending/shading operation for performing a subsequent blending/shading operation of said resulting output with a subsequent texture sample output.

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45. A graphics processing pipeline that renders and displays images at least in part in response to polygon vertex data and texture data, comprising:

a recirculating texturing pipeline arrangement having a single texture address coordinate/data processing unit, a single texture retrieval unit, and a texture lookup data feedback path for recirculating selected retrieved texture lookup data from the texture retrieval unit back to the texture address coordinate/data processing unit; and

a recirculating shade-tree alpha/color blender arrangement having a hardware shader connected to receive an output of the texture retrieval unit and a feedback path from an output of the hardware shader to an input of the shader for recirculating selected blended color or opacity output data, wherein the recirculating arrangement blends selected shader inputs to provide an output that is fed back for use as an input to the shader for a subsequent blending operation.

46. The pipeline of claim 45 wherein said single texture address coordinate/data processing unit interleaves the processing of logical direct and indirect texture coordinate data.

47. In a graphics system, a multitexture processing subsystem comprising:

a texturing arrangement having a single texture address coordinate/data processing unit, a single texture retrieval unit, and a texture lookup data feedback path for recirculating retrieved indirect texture lookup data from a single texture retrieval unit back to the texture address coordinate/data processing unit; and

a recirculating hardware shader connected to receive an output of the texture retrieval unit, wherein the shader blends selected received outputs to provide a calculated color or opacity output that is selectively fed back for use as an input to the shader for a subsequent blending operation.

48. The graphics system of claim 47 wherein said single texture address coordinate/data processing unit interleaves the processing of logical direct and indirect texture coordinate data.